



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**REGION 10**  
 1200 Sixth Avenue  
 Seattle, Washington 98101

Reply To  
 Attn Of: OEA-095

September 27, 2004

**MEMORANDUM**

**TO:** Dr. D. Wayne Berman, Aeolus, Inc.

**FROM:** Julie Wroble, Office of Environmental Assessment, Risk Evaluation Unit  
 Dr. Mark Maddaloni and Charles Nace, EPA Region 2

**CC:** Dan Heister, Office of Environmental Cleanup, Oregon Operations Office  
 Alan Goodman, Office of Environmental Cleanup, Oregon Operations Office  
 Dr. Pat Cirone, Unit Manager, Office of Environmental Assessment, Risk Evaluation Unit  
 Cliff Villa, Office of Regional Counsel  
 Dulcy Berry, PBS Environmental

**SUBJECT:** Comments on Draft Preliminary Report: Evaluating Exposure and Risk to Household Residents from Air and Screening Dust Sampling, September 13, 2004.

Attached please find EPA's comments on the above-mentioned deliverable. Note that I have incorporated comments provided by Mark Maddaloni and Charles Nace of EPA, Region 2. These scientists have been addressing World Trade Center dust contaminated with asbestos in lower Manhattan for the past several years and their input is extremely valuable to this project. Based on my review and comments submitted by Region 2, I recommend rewriting this document to limit the quantitative analyses based on the dust data collected at North Ridge Estates. I strongly discourage the use of this data as a key component of any risk management decisions made at this site.

Please call me at 206/553-1079 if you have any questions or comments.

**Specific Comments:**

Page 1, 3rd paragraph: Generally, when a sampling event is initiated there is a clear purpose for why the data is being collected and a detailed (and scientifically supported) description of how the data will be used. For this evaluation, the purpose that was identified was to estimate the risk from settled dust and thus a plan was developed to sample dust from homes. It is noted that there are currently no generally recognized or accepted methods for collecting and analyzing household dust in a manner suitable for risk assessments, and further, that one method (which just happens to be the one of the most commonly used for dust sampling and has a "standard protocol") has been declared "junk science" in a court of law. Fine, law is not science and science is not law...but the reasons cited for the "junk science" label is that (a) there is a lack of a systematic procedure for linking measurements to airborne exposure and (b) the method requires using an indirect transfer technique. If one were to look at what was done in this evaluation a similar conclusion would be reached. Namely that the methodology used to link dust concentrations to indoor air concentrations is not a systematic procedure and that an indirect transfer technique was used...thus the results could be labeled as "junk science." The primary flaw with the evaluation is the sampling and analytical methodology; the quality of the data is very questionable and anything that results from questionable data is very suspect. Therefore, anything other than a qualitative evaluation of this data will not be acceptable to EPA.



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Page 1, 4th paragraph: This section states, "The SOP ultimately applied at the site involves sample collection using a vacuum cleaner with a small sub-section of the vacuum bag being ashed, suspended in water, sonicated and refiltered." This is essentially an indirect transfer preparation; however, in Section 3.3 of the report, the same quote is followed by "the resulting filter was then prepared by a direct transfer technique for analysis by TEM." Appendix C describes a direct prep of material in the vacuum bag; however, this technique was not employed so is it relevant? These issues are confusing and exactly what was done with the sample should be clearly and consistently explained in the text.

Page 2, first word on page: Replace "estate" with "subdivision."

Page 3: Please provide the reference cited in this footnote.

Page 4, Section 2.2: The methodology that was employed to prepare the sample for asbestos quantification seems very preliminary. It is unclear why dust collected using a vacuum cleaner would not automatically be assumed to contain a lot of lint and other loose fibrous material. This "surprise" necessitated the first change in methodology. Then it was decided to burn the entire bag, which also proved problematic. Then, a part of the bag was burned, and then placed in water, sonicated, filtered and plated out on a filter for analysis. This trial-and-error approach further supports our preference to consider these data only qualitatively.

Page 5, third full paragraph: The text states that asbestos fibers would be expected to be embedded in the vacuum bag. What is the basis for this assumption? Two paragraphs later the text states that a positive control indicated that the approach adequately recovered structures from a vacuum bag spiked with liquid suspension containing known quantities of asbestos; however, asbestos in carpet dust is not expected to behave as asbestos fibers suspended in a liquid. This part of the approach seems very uncertain to me. Factors that might influence the extent to which fibers are embedded in the bag include: the relative proportion of asbestos fibers to dust and other solid materials, the amount of time the area is vacuumed, the nature of the carpet being vacuumed, and the relative humidity, to name a few. Also, would some areas of the bag be more likely to contain embedded fibers than other areas. Was an attempt made to always sample the same part of the vacuum bag? If not, how was the location on the bag selected? These questions have a large effect on the quality of the data and I would think a detailed statistical analysis should be rejected until the data quality can be better assessed.

Page 8, see previous comments on describing filter preparation as a direct transfer technique. In fact, the first part of the preparation is indirect, which may lead to uncertainty in the results.

Page 10 (Equations 4.1, 4.2, and 4.3): This is a bit hard to follow but it would seem that the relationship between the concentration of asbestos in the matrix of the bag and in the dust contained therein would need to be understood to support the use of these equations. Do we understand the relationship between dust in the bag to fibers embedded in the bag?

Page 11, first paragraph: It is stated that if the data is statistically similar between houses then the data would suggest that the dust concentrations within the houses are all in equilibrium with a common, outdoor environment. Do the data really support this or can you only say that the asbestos load in the dust is similar in all of the houses. It does not relate to the source of the asbestos or to what is outside of the house. I also noted that in Table 1, there seems to be, at least nominally, a big difference in the mass of dust that was collected in the houses (ranging from 17 g to 184.27 g) but I did not see any discussion regarding any differences in the number of fibers per the mass of dust. Would this affect the indoor air concentration or be a reflection of heterogeneous household dust vs. the homogeneous dust that is being reported?

There is a very poor correlation between asbestos in settled dust and indoor air in individual homes: "When

structures were detected in a residence, they tended to be detected either in dust or air, but not both." However, despite this apparent lack of correlation, a chi-square analysis is performed. The observed and expected values cited in the chi square analysis have substantial uncertainty which is not accounted for. In the case of the expected value, the detection limit is used, but 18 of the 20 samples were "non-detects" so the expected value is really somewhere between zero and the detection limit. In the case of the 2 residences where one asbestos fiber was identified (i.e., observed values) there is a large confidence interval in this value (i.e., one fiber) that is not being reported.

Page 13, first full paragraph, last sentence: Table 3 is being identified as showing the statistical similarity between asbestos concentrations in homes. Are statistical analyses really appropriate for data sets comprised primarily of non-detects? Please explain further why the statistical test suggests a complete lack of correlation. Given the above uncertainties in how the data were collected and analyzed, and also given that most of the results are non-detects, is such a statistical comparison even appropriate?

Page 13, second paragraph: The hypothesis that asbestos in settled dust is readily re-entrained into the air to equilibrium levels by activities such as walking into a room or sitting in a room is not one that is easily supported. At Libby, indoor sampling showed that stationary monitors collected far fewer fibers than monitors worn by people doing activities, so one would not necessarily expect to see elevated levels in indoor air samples in houses with asbestos in settled dust where samples were collected from stationary monitors. In addition, this hypothesis is extremely hard to validate in this evaluation since there were so many non-detect samples.

Page 14, first full paragraph: As indicated above, the correlation between dust and air really depends on what activities were being done and how the air samples were collected. There is a correlation, but it is hard to measure what it is because of the many factors that affect it. Again, why bother with two statistical analyses when it is already obvious that there is no correlation and that the data sets are primarily non-detect data...statistics do not help you here.

Page 15, first full sentence: How were mass loadings of total household dusts on carpets determined as presented in the last column of Table 5? Please explain how the means and 95% UCLs presented in Table 5 were calculated. For results below the detection limits, what value was assumed: the detection limit, one half the detection limit, or zero?

Page 16, last two paragraphs: The first paragraph states that it was assumed that there are reasonably stable conditions outside. As far as asbestos is concerned, I thought that there were "peaks" with ACM heaving, and a variety of weather conditions that would make outdoor concentrations anything but stable, such as moisture, wind speed, snow cover, etc. It also says that the amount of asbestos entering a home and leaving a home balance out. As the ACM is scattered throughout, I would say that the asbestos is heterogeneously dispersed, rather than homogeneously dispersed, which could result in "tracking" different amounts of asbestos into different homes and that there would not be a balance.

In the second paragraph, there is mention of outdoor air and indoor air coming into equilibrium. I believe that the studies that have been done to evaluate how the shell of the house affects the ratio of particles in the house to outside of the house have only looked at ambient air contributions. Therefore, it may be conceivable that the ambient outdoor air concentrations and indoor concentrations may reach equilibrium when the home are vacant because the shell of the house does not impeded air flow for small particles; but I do not think that the studies published in the literature support an equilibrium when internal sources of particles are included. For example, when one is cooking indoors using a gas stove, the particulate concentration in the indoor air would increase above what is found outside and there would not be equilibrium when indoor and outdoor concentrations are compared.

Page 17, last full paragraph: The discussion regarding the re-entrainment potential for aggressive activities seems extremely speculative (i.e., twenty times the dust generating potential of routine activities for 20% of

the time). Further, how are "routine" activities defined?

Page 19, first full paragraph: It is stated that it is expected that asbestos in household dust and indoor air should come into rapid equilibrium. I do not agree with this statement.

Page 20, first full paragraph: The information presented in this paragraph and in Table 8 is very confusing. A more clear presentation of the data is needed.

Page 21, Section 5.3, first paragraph: This is the first place in this report that it is mentioned that all of the structures observed are chrysotile. This is an important finding and should be described earlier in the report.

Table 2: The data presented in this table are air data, not dust data. Please correct.

Table 6: The heading "asbestos loading on carpet" and units (s/cc) do not match. Please resolve.